Listing of Claims

1. (Currently Amended) A method of producing hydrogen upon demand for use in a hydrogen consuming application, the method comprising:

preparing a mixture of particles of a hydride and a hydroxide for release of hydrogen upon demand; and, upon a demand for hydrogen from the mixture,

reacting a first portion of the hydride particles in the mixture ~~of a hydride~~ with water to produce heat in an amount to initiate reaction between ~~a first reaction and reacting, in the solid state, a mixture of~~ a second portion of particles of said hydride and particles of the ~~a~~ hydroxide in a second reaction, by transferring said heat thereto, ~~the respective portions of particles being mixed together,~~ the first portion and the second portion of particles of said hydride reacting substantially completely with the water and particles of the hydroxide to form hydrogen and an oxide.

2. (Canceled)

3. (Original) The method according to claim 1 wherein said first reaction produces at least a portion of said hydroxide.

4. (Original) The method according to claim 1 wherein said second reaction commences while said first reaction is occurring.

5. (Original) The method according to claim 1 wherein said second reaction is exothermic.

6. (Canceled)

7. (Original) The method according to claim 1 wherein said water is added to said hydride.

8. (Original) The method according to claim 7 wherein said amount of heat generated is greater than or equal to an activation energy of said second reaction.

9. (Canceled)

10. (Previously Presented) The method according to claim 1 wherein said hydride is represented by the formula: $MI^{x}H_{x}$, where MI represents one or more cationic species other than hydrogen and x represents an average valence state of MI.

11. (Previously Presented) The method according to claim 1 wherein said hydroxide is represented by the formula: $MII^{y}(OH)_{y}$, where MII represents one or more cationic species other than hydrogen and y represents an average valence state of MII.

12. (Previously Presented) The method of claim 1 wherein said hydride is represented by $MI^{x}H_{x}$ and said hydroxide is represented by $MII^{y}(OH)_{y}$, where MI and MII respectively represent one or more cationic species other than hydrogen, and x and y represent average valence states of MI and MII, respectively.

13. (Canceled)

14. (Previously Presented) The method of claim 12 wherein MI and MII comprise one or more of the same cationic species.

15. (Previously Presented) The method of claim 12 wherein MI or MII is a complex cationic species comprising two distinct cationic species.

16.-18. (Canceled)

19. (Previously Presented) The method of claim 12 wherein said hydroxide further comprises: $MII^{y}(OH)_{y}\cdot wH_{2}O$, where w represents a stoichiometric amount of hydrated water.

20. (Previously Presented) The method according to claim 1 wherein said hydroxide is represented by the formula: $MII^{y}(OH)_{y}\cdot wH_2O$, where MII represents one or more cationic species other than hydrogen, y represents an average valence state of MII, and w represents a stoichiometric amount of hydrated water.

21. (Previously Presented) The method of claim 1 wherein said hydride is represented by $MI^{x}H_x$ and said hydroxide is represented by $MII^{y}(OH)_{y}\cdot wH_2O$, where MI and MII respectively one or more cationic species other than hydrogen, x and y represent an average valence state of MI and MII, respectively, and w represents a stoichiometric amount of hydrated water.

22- 25. (Canceled)

26. (Previously Presented) The method according to claim 1 wherein said hydride is selected from the group consisting of: lithium hydride (LiH), lithium borohydride ($LiBH_4$), lithium alanate ($LiAlH_4$), and mixtures thereof.

27. (Previously Presented) The method according to claim 1 wherein said hydroxide is lithium hydroxide.

28. (Original) The method according to claim 1 wherein said hydride comprises LiH and said hydroxide comprises LiOH.

29. (Original) The method according to claim 28 wherein said second reaction proceeds according to a reaction mechanism of $LiH + LiOH \rightarrow Li_2O + H_2$.

30-47. (Canceled)

48. (Original) The method according to claim 1 where said hydride comprises $LiBH_4$ and said hydroxide comprises LiOH.

49. (Original) The method according to claim 48 where said second reaction proceeds according to a reaction mechanism of $LiBH_4 + 4\ LiOH \rightarrow LiBO_2 + 2\ Li_2O + 4H_2$.

50-53. (Canceled)

54. (Original) The method according to claim 1 wherein at least a portion of said water is provided in the form of a hydrated hydroxide compound.

55. (Previously Presented) The method according to claim 54 wherein said hydrated hydroxide compound is selected from the group consisting of: hydrated lithium hydroxide ($LiOH{\cdot}H_2O$), hydrated lithium aluminum hydroxide ($LiAl_2(OH)_7{\cdot}2H_2O$), and mixtures thereof.

56. (Canceled)

57. (Previously Presented) The method according to claim 54 wherein said hydride comprises LiH and said hydroxide comprises $LiOH{\cdot}H_2O$, the $LiOH{\cdot}H_2O$ providing at least a portion of said water and of said hydroxide.

58-60. (Canceled)

61. (Previously Presented) The method according to claim 54 wherein said hydride comprises $LiBH_4$ and said hydroxide comprises $LiOH{\cdot}H_2O$, the $LiOH{\cdot}H_2O$ providing at least a portion of said water and of said hydroxide.

62. (Canceled)

63. (Original) The method according to claim 54 where in said hydroxide comprises a non-hydrated hydroxide compound and a hydrated hydroxide compound.

64. (Original) The method according to claim 63 where said hydride comprises $LiBH_4$ and said hydroxide comprises LiOH and $LiOH{\cdot}H_2O$.

65. (Original) The method according to claim 63 where said reaction proceeds according to a reaction mechanism of $LiBH_4 + LiOH + LiOH{\cdot}H_2O \rightarrow Li_3BO_3 + 2\ Li_2O + 4H_2$.

66. (Original) The method according to claim 63 where said reaction proceeds according to a reaction mechanism of $2\ LiBH_4 + LiOH + 2\ LiOH{\cdot}H_2O \rightarrow Li_4B_2O_5 + LiH + 7\ H_2$.

67. (Currently Amended) A method of producing hydrogen upon demand for use in a hydrogen consuming application, the method comprising:

preparing a mixture of particles of a hydride and a hydroxide for release of hydrogen upon demand; and, upon a demand for hydrogen from the mixture,

generating heat in a first reaction by reacting water with a portion of particles of the ~~a~~ hydride present in the mixture ~~a first material composition~~, wherein said heat is used to initiate ~~in~~ a second reaction within the mixture; and

reacting in the ~~solid-state~~ mixture another portion of particles of said hydride ~~present in said first material composition which are mixed~~ with particles of the ~~a~~ hydroxide ~~present in a second material composition~~ in said second reaction, thereby forming hydrogen gas and a byproduct composition comprising an oxide, the portion of hydride particles participating in the first reaction being in contact with the other portion of hydride particles and the hydroxide particles to provide said heat for initiation of the second reaction.

68. (Original) The method according to claim 67 wherein said second reaction commences while said first reaction is occurring.

69. (Original) The method according to claim 67 wherein said heat provides an activation energy sufficient to commence said second reaction.

70. (Original) The method according to claim 67 wherein said second reaction is exothermic.

71. (Canceled)

72. (Currently Amended) A hydrogen storage composition having a hydrogenated state for production of hydrogen upon demand for use in a hydrogen consuming application and a dehydrogenated state after production of such hydrogen:

(a) in said hydrogenated state, said composition comprises a mixture of particles of a hydride and a hydrated hydroxide, the quantity of the hydride being sufficient to react with the water content and hydroxide content of the hydrated hydroxide for a solid-state reaction to produce hydrogen gas and an oxide; and

(b) in said dehydrogenated state, said composition comprises the oxide.

73. (Previously Presented) The composition of claim 72 wherein said hydride is represented by the formula $MI^{x}H_{x}$, where MI represents one or more cationic species other than hydrogen, and x is an average valence state of MI.

74. (Previously Presented) The composition of claim 72 wherein said hydrated hydroxide is represented by the formula $MII^{y}(OH)_{y}\cdot wH_{2}O$, where MII represents one or more cationic species other than hydrogen, y is an average valence state of MII, and w represents the stoichiometric ratio of water in said hydrated hydroxide.

75. (Previously Presented) The composition of claim 72 wherein said hydride is represented by $MI^{x}H_{x}$ and said hydrated hydroxide is represented by $MII^{y}(OH)_{y}\cdot wH_{2}O$, where MI and MII respectively one or more cationic species other than hydrogen, x and y represent average valence states of MI and MII, respectively, and w represents the stoichiometric ratio of water in said hydrated hydroxide.

76. (Previously Presented) The composition of claim 72 wherein said hydride is represented by $MI^{x}H_{x}$ and said hydrated hydroxide is represented by $MII^{y}(OH)_{y}\cdot wH_{2}O$, where MII represents one or more cationic species other than hydrogen, y represents an average valence state of MII, and w represents a stoichiometric amount of hydrated water.

77-79. (Canceled)

80. (Previously Presented) The composition of claim 76 wherein MI and MII are each lithium.

81. (Previously Presented) The composition according to claim 72 wherein said hydrated hydroxide is selected from the group consisting of: hydrated lithium hydroxide ($LiOH \cdot H_2O$), hydrated lithium aluminum hydroxide ($LiAl_2(OH)_7 \cdot 2H_2O$), and mixtures thereof.

82. (Previously Presented) The composition of claim 72 wherein said hydride is selected from the group consisting of: lithium hydride (LiH), lithium borohydride ($LiBH_4$), lithium alanate ($LiAlH_4$), and mixtures thereof.

83. (Canceled)

84. (Original) The composition of claim 72 wherein said hydride comprises LiH and said hydrated hydroxide comprises $LiOH \cdot H_2O$.

85-87. (Canceled)

88. (Original) The composition of claim 72 wherein said hydride comprises $LiBH_4$ and said hydrated hydroxide comprises $LiOH \cdot H_2O$.

89. (Canceled)